Electronic Version
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Claims

[c1] An olefin process, comprising:

passing a light alkane stream comprising ethane, propane or a combination thereof through a steam pyrolysis zone and quenching effluent therefrom to form a pyrolysis effluent enriched in ethylene, propylene or a combination thereof;

cracking a light hydrocarbon stream comprising olefins having at least 4 carbon atoms in a first FCC zone to form a first FCC effluent enriched in ethylene, propylene or a combination thereof;

cracking a refinery stream comprising gas oil, full range gas oil, resid, or a combination thereof, in a second FCC zone to form a second FCC effluent enriched in ethylene, propylene or a combination thereof;

fractionating the first and second FCC effluents together to remove heavy naphtha, light cycle oil, slurry oil, or a combination thereof and recover a combined olefin-containing FCC fraction;

conditioning the pyrolysis effluent together with the combined FCC fraction to remove oxygenates, acid gases, water or a combination thereof to form a con-

ditioned stream;

separating the conditioned stream into at least a tail gas stream, an ethylene product stream, a propylene product stream, a light stream comprising ethane, propane, or a combination thereof, an intermediate stream comprising olefin selected from C_4 to C_6 olefins and mixtures thereof, and a heavy stream comprising C_6 and higher hydrocarbons;

recycling the light stream to the steam pyrolysis zone; and

recycling the intermediate stream to the first FCC zone.

[c2] The olefin process of claim 1, further comprising recycling the heavy stream to the first FCC zone.

[c3] The olefin process of claim 1, further comprising:

hydrotreating the heavy stream to obtain a hydrotreated stream;

extracting a product stream comprising benzene, toluene, xylenes or a mixture thereof from the hydrotreated stream to obtain a raffinate stream lean in aromatics; and

recycling the raffinate stream to the steam pyrolysis zone.

[c4] The olefin process of claim 1, wherein the light alkane

stream passed through the steam pyrolysis zone further comprises naphtha.

[c5] The olefin process of claim 1, wherein the light alkane stream passed through the steam pyrolysis zone further comprises LPG.

[c6] The olefin process of claim 1, wherein the light hydrocarbon stream cracked in the first FCC zone comprises FCC naphtha.

[c7] The olefin process of claim 1, wherein the light hydrocarbon stream cracked in the first FCC zone comprises olefins having from 4 to 8 carbon atoms.

[c8] The olefin process of claim 1, wherein the refinery stream cracked in the second FCC zone comprises waxy gas oil.

[c9] An olefin process unit, comprising:

parallel steam pyrolysis, light olefin FCC and gas oil-resid FCC zones for producing a combined effluent comprising ethylene and propylene;

means for conditioning the combined effluent to remove oxygenates, acid gases and water to form a conditioned stream;

means for separating the conditioned stream into at least a tail gas stream, an ethylene product stream, a

propylene product stream, a light stream comprising ethane, propane, or a combination thereof, an intermediate stream comprising olefin selected from C_4 to C_6 olefins and mixtures thereof, and a heavy stream comprising C_6 and higher hydrocarbons;

means for recycling the light stream to the steam pyrolysis zone; and

means for recycling the intermediate stream to the first FCC zone.